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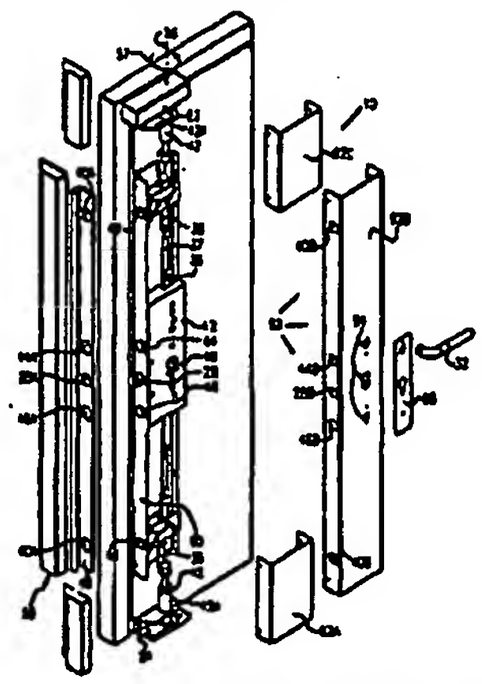
(54) Title: SYMMETRIC DOOR LOCK



(57) Abstract: This invention discloses a door lock (10) including a lock case (12) mountable on an external surface of a door, a key-operated lock cylinder (16) mounted in the lock case (12), a locking mechanism (18) mounted in the lock case (12) and actuable by the lock cylinder (16), and a plurality of locking bolts (28, 40, 42, 46), operatively linked to the locking mechanism (18), arranged for protruding outwards of the lock case (12), the locking bolts (28, 40, 42, 46), the lock cylinder (16) and the locking mechanism (18) being arranged with respect to each other so as to permit mounting the door lock (10) on both left-side and right-side opening doors by rotating the lock case (12), together with the lock cylinder (16), the locking mechanism (18) and the locking bolts (28, 40, 42, 46), generally 180° about a principal axis of the lock case (12).

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SYMMETRIC DOOR LOCK

FIELD OF THE INVENTION

The present invention relates generally to door locks and particularly to a door lock mounted externally on a door, the lock being symmetric to permit either left-side or right-side opening.

BACKGROUND OF THE INVENTION

Mortise locks, also known as rim locks, are well known locks set in a recess at an edge of a door and which includes latches or bolts which can be thrown into a locking engagement with recess formed in the door post. In some countries, most notably France, the lock is not set in a recess of the door, but rather is set in an external, generally rectangular housing mounted on the door. This housing generally extends along the full height of the door, and is covered by some sheet metal covering or the like.

The external rim lock has several disadvantages. The height of doors is not standardized, ranging generally from approximately 2-2.5 meters. This forces the manufacturer of such locks to supply the locking bolts and coverings of the lock with relatively long lengths of about 2.5 meters, the bolts and coverings being cut or trimmed at the installation site. The long length is awkward to handle, transport and cut. In addition, the lock mounting is generally not symmetrical, meaning that the manufacturer must supply two sets of locks, one set for right-side mounting and the other for left-side mounting.

SUMMARY OF THE INVENTION

The present invention seeks to provide an improved door lock mounted externally on a door, the lock being symmetric to permit either left-side or right-side opening. Decorative coverings are not provided in one awkward length, but rather in three portions, thereby simplifying handling, transporting and trimming the coverings. The middle portion of the decorative covering is symmetric with respect to the lock, thereby maintaining the possibility for either left-side or right-side opening. The door lock is provided with a dead bolt mechanism as well.

There is thus provided in accordance with a preferred embodiment of the present invention a door lock including a lock case mountable on an external surface of a

door, a key-operated lock cylinder mounted in the lock case, a locking mechanism mounted in the lock case and actuable by the lock cylinder, and a plurality of locking bolts, operatively linked to the locking mechanism, arranged for protruding outwards of the lock case, the locking bolts, the lock cylinder and the locking mechanism being arranged with respect to each other so as to permit mounting the door lock on both left-side and right-side opening doors by rotating the lock case, together with the lock cylinder, the locking mechanism and the locking bolts, generally 180° about a principal axis of the lock case.

In accordance with a preferred embodiment of the present invention the plurality of locking bolts includes a latch bolt, operatively linked to the locking mechanism, arranged for protruding sideways out of the lock case, wherein the latch bolt can be detached from the locking mechanism, rotated generally 180° about a principal axis of the latch bolt and re-attached to the locking mechanism, the lock case being formed with an access opening through which access can be gained to detach the latch bolt from the locking mechanism.

Further in accordance with a preferred embodiment of the present invention at least one of the plurality of locking bolts is linked by a link element to the locking mechanism, and the link element can be detached from the locking bolt, rotated generally 180° about a principal axis of the locking bolt and re-attached to the locking bolt.

Still further in accordance with a preferred embodiment of the present invention there is provided a housing mountable to an external surface of a door, the lock case being disposed in the housing, and a decorative cover is attached to the housing.

In accordance with a preferred embodiment of the present invention the decorative cover includes a middle portion with holes formed therein to accommodate protrusion therethrough of at least some of the locking bolts, the holes being symmetrical with respect to the lock cylinder and the locking mechanism, a lower portion, and an upper portion, the upper portion being trimmable.

Additionally in accordance with a preferred embodiment of the present invention the locking mechanism has a height which may be adjusted with respect to a height of a door.

Further in accordance with a preferred embodiment of the present invention a locking plate is operatively linked to the locking mechanism and operative to block movement of at least one of the locking bolts when the locking mechanism is in a locked configuration, thereby causing the at least one locking bolt to be a dead bolt.

Still further in accordance with a preferred embodiment of the present invention a locking plate is operatively linked to the locking mechanism and operative to block movement of the latch bolt when the locking mechanism is in a locked configuration, thereby causing the latch bolt to be a dead bolt.

Additionally in accordance with a preferred embodiment of the present invention a cylinder guard is rotatably mounted on the lock cylinder.

In accordance with a preferred embodiment of the present invention the lock cylinder is formed with at least one notch, and the lock case comprises at least one correspondingly formed protrusion which mates with the at least one notch.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified exploded illustration of a door lock constructed and operative in accordance with a preferred embodiment of the present invention;

Figs. 2 and 3 are simplified pictorial illustrations of the door lock of Fig. 1 mounted on a right-side opening door and a left-side opening door, respectively, in accordance with a preferred embodiment of the present invention;

Fig. 4 is a simplified cutaway illustration of a locking mechanism of the door lock of Fig. 1, before dead-bolt locking a latch bolt;

Fig. 5 is a further cutaway illustration of the locking mechanism of the door lock of Fig. 1, before dead-bolt locking the latch bolt;

Fig. 6 is a cutaway illustration of the locking mechanism of the door lock of Fig. 1, after dead-bolt locking the latch bolt;

Fig. 7 is a further cutaway illustration of the locking mechanism of the door lock of Fig. 1, after dead-bolt locking the latch bolt;

Fig. 8 is a simplified exploded, cutaway illustration of the locking mechanism of the door lock of Fig. 1, showing access to the latch bolt through an opening in a lock case;

Figs. 9 and 10 are simplified pictorial illustrations of a locking bolt of the door lock of Fig. 1, respectively before and after rotating a link element;

Fig. 11 is a simplified pictorial illustration of a cylinder guard useful in the door lock of Fig. 1, constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 12 is a simplified end view of the lock guard of Fig. 11, taken along an arrow XII in Fig. 11;

Fig. 13 is a simplified side view of the lock guard of Fig. 11; and

Fig. 14 is a simplified sectional view of the lock guard of Fig. 11, corresponding to the side view of Fig. 13.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Reference is now made to Figs. 1, 4 and 5 which illustrate a door lock 10 constructed and operative in accordance with a preferred embodiment of the present invention. Door lock 10 preferably includes a lock case 12 mountable on an external surface of a door 14. A key-operated lock cylinder 16 (Fig. 4) is mounted in lock case 12.

A locking mechanism 18 is mounted in lock case 12 and is actuable by lock cylinder 16. As seen in Fig. 4, locking mechanism 18 may typically include a toothed cam 20 which meshes with a pinion gear 22 of lock cylinder 16. Cam 20 is operatively linked to a plurality of locking bolts. For example, cam 20 may be operatively linked to a bolt thrower 24 which is attached, typically by means of a pinned connection 25, to a plate 26 to which is attached a latch bolt 28. A door-knob-receiving element 30 is also typically operatively connected to latch bolt 28 via bolt thrower 24, so that latch bolt 28 can be thrown by turning a handle 32 (Fig. 1) of door 14, as is well known in the art. Cam 20 is also preferably linked by means of linkage arms 34 and 36 (Fig. 5) to a link element 38 (Fig. 1) operatively connected via an intermediate element 37 (Fig. 1) to a horizontally-moving locking bolt 40 and a vertically-moving locking bolt 42. The structure and operation of link element 38 and locking bolt 40 will be described further

hereinbelow with reference to Figs. 9 and 10. Cam 20 is also preferably operatively linked to a pair of locking bolts 44 and 46 which protrude sideways out of lock case 12.

As is seen in Fig. 1, latch bolt 28 and locking bolts 40, 44 and 46 are received in apertures 28A, 40A, 44A and 46A, respectively, formed in a side-frame member 48 of a door frame assembly 50. Locking bolts 42 are received in apertures 42A formed in upper and lower frame members 52 and 54.

It is a particular feature of the present invention that latch bolt 28 and locking bolts 40, 44 and 46 are arranged symmetrically with respect to lock cylinder 16 and locking mechanism 18 so as to permit mounting door lock 10 on both left-side and right-side opening doors. This is preferably accomplished by rotating lock case 12, together with lock cylinder 16, locking mechanism 18, latch bolt 28 and locking bolts 40, 44 and 46, generally 180° about a principal axis 56 of lock case 12, such as in the direction of an arrow 57 in Fig. 1. It is noted that a principal axis is defined as any of three mutually perpendicular axes passing generally through the centroid of lock case 12. In the illustrated embodiment, the symmetrical mounting is accomplished by rotating lock case 12 generally 180° about the longitudinal axis of lock case 12. Figs. 1 and 2 illustrate door lock 10 mounted on a right-side opening door, whereas Fig. 3 illustrates door lock 10 mounted on a left-side opening door.

After rotating lock case 12 generally 180° about axis 56 of lock case 12, all the locking bolts will be aligned with their corresponding apertures in door frame assembly 50 without any further need for adjustment or rotation, with the one exception of latch bolt 28 which, on account of its slanted extremity, must be rotated as well. This can be conveniently accomplished without any need for opening lock case 12 as is now described with reference to Fig. 8.

Lock case 12 is preferably formed with an access opening 58 through which access can be gained to detach latch bolt 28 from locking mechanism 18. For example, a screwdriver 60 can be inserted through access opening 58 and used to unscrew latch bolt 28 from plate 26. Latch bolt 28 can then be rotated generally 180° about a principal axis 62 thereof (in the illustrated embodiment a longitudinal axis of latch bolt 28), such as in the direction of an arrow 64 to the orientation noted by an arrow 65, and re-attached to plate 26 of locking mechanism 18.

Depending on the shape and size of link element 38, it may also be necessary to rotate link element 38 after rotating lock case 12 generally 180° about axis 56 of lock case 12, as is now described with reference to Figs. 9 and 10. Link element 38 preferably slides in a case 66 and is linked to locking bolt 40 by means of a front plate 72. A circlip 70 may be used to attached locking bolt 40 to front plate 72 at a joint 68. Front plate 72 is preferably formed with a groove 74 which receives therein a pin 76 attached to link element 38. Fig. 9 shows the orientation of link element 38 as seen in Fig. 1. After rotating lock case 12 generally 180° about axis 56 of lock case 12, link element must be rotated 180° in the direction of an arrow 77 (Fig. 9) about a principal axis 78 of locking bolt 40 (e.g., its longitudinal axis) to the orientation shown in Fig. 10. This is easily accomplished by removing circlip 70, and flipping front plate 72 and link element 38 about axis 78 by 180°.

Reference is now made to Figs. 4 and 6. In accordance with a preferred embodiment of the present invention, some (or all) of the locking bolts of door lock 10 have dead bolt action. Door lock 10 preferably includes a locking plate 80 (omitted for clarity in Figs. 5 and 7) operatively linked to linkage arms 34 of locking mechanism 18. Locking bolts 44 and 46 are preferably attached to locking plate 80. In Fig. 4, locking plate 80 is distanced from plate 26 of latch bolt 28. When cam 20 is rotated in the direction of an arrow 82 (Fig. 4), locking mechanism 18 is in a locked configuration, and locking plate 80 is moved in the direction of an arrow 84 to the position shown in Fig. 6. In this position, locking plate 80 abuts against plate 26, thereby blocking movement of latch bolt 28. Linkage arm 34 is preferably linked to locking plate by means of a pin 86 which slides in a groove 88 formed in locking plate 80. As is seen in Fig. 4, groove 88 has an inclined portion 88A which terminates in a generally straight portion 88B. In the position of Fig. 6, pin 86 rests in portion 88B, thereby preventing movement of locking plate 80 and latch bolt 28 in a direction opposite to arrow 84. Thus, in the position of Fig. 6, latch bolt 28 is a dead bolt.

Reference is now made again to Figs. 9 and 10. Groove 74 preferably has an inclined portion 74A which terminates in a generally straight portion 74B. When locking mechanism 18 is in a locked configuration, pin 76 rests in portion 74B, thereby preventing movement of front plate 72 and locking bolt 40 in a direction opposite to an

arrow 83 (Fig. 9). Thus, when locking mechanism 18 is in a locked configuration, locking bolt 40 is a dead bolt.

Reference is now made again to Fig. 1. Door lock 10 preferably includes a housing 90 mounted to the external surface of door 14. Housing 90 may be formed as a U-channel which spans the height of door 14, although many other shapes are possible within the scope of the present invention. Lock case 12 is disposed in housing 90. A decorative cover 92 is attached to housing 90. Decorative cover 92 preferably includes a lower portion 92A, a middle portion 92B and an upper portion 92C. Middle portion 92B is preferably formed with holes 28B, 40B, 44B and 46B to accommodate protrusion therethrough of latch bolt 28 and locking bolts 40, 44 and 46, respectively. Holes 28B, 40B, 44B and 46B are preferably symmetrical with respect to lock cylinder 16 and locking mechanism 18. Since decorative cover 92 is provided in three relatively short portions, decorative cover 92 may be easily transported, handled and trimmed, thereby solving the problem of the unwieldy and awkward covers of the prior art. Lower portion 92A and middle portion 92B are preferably generally supplied with a standard length and are not normally trimmed. Middle portion 92B is also preferably formed with a plurality of holes 94 for accommodating mounting an escutcheon plate 96. Upper portion 92C is preferably trimmable at an installation site. The height of any of the vertically-arranged locking bolts and link elements may be adjusted, if necessary, by trimming, removing or changing some of the link elements or locking bolts. Thus, door lock 10 enables easy and convenient height adjustment, so as to fit all standard and even non-standard heights of doors, while at the same time being adaptable for both left-side and right-side mountings.

Reference is now made again to Figs. 4 and 5. In accordance with a preferred embodiment of the present invention, lock cylinder 16 may be formed with one or more notches or grooves 47, and lock case 12 includes correspondingly formed protrusions 49 which mate with notches 47. (This optional structure is shown only in Figs. 4 and 5.) Because of the presence of protrusions 49, only a lock cylinder with the corresponding notches or grooves 47 can be mounted in lock case 12. Thus this structure prevents insertion of standard profile lock cylinders in lock case 12 of door lock 10.

Reference is now made to Figs. 11-14 which illustrate a cylinder guard 100 useful in door lock 10. Lock cylinder 16 is preferably mounted through a cover plate 102 of lock case 12. Cylinder guard 100 preferably includes a base 104 onto which is rotatably mounted a guard member 106. By virtue of guard member 106 being able to freely rotate about base 104, one cannot use pliers or the like to grasp cylinder guard 100 and violently torque the guard 100 off lock cylinder 16. Thus, cylinder guard 100 substantially prevents vandalism to and tampering with door lock 10.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention includes both combinations and subcombinations of the features described hereinabove as well as modifications and variations thereof which would occur to a person of skill in the art upon reading the foregoing description and which are not in the prior art.

CLAIMS

What is claimed is:

1. A door lock comprising:

a lock case mountable on an external surface of a door;

a key-operated lock cylinder mounted in said lock case;

a locking mechanism mounted in said lock case and actuable by said lock cylinder; and

a plurality of locking bolts, operatively linked to said locking mechanism, arranged for protruding outwards of said lock case, said locking bolts, said lock cylinder and said locking mechanism being arranged with respect to each other so as to permit mounting said door lock on both left-side and right-side opening doors by rotating said lock case, together with said lock cylinder, said locking mechanism and said locking bolts, generally 180° about a principal axis of said lock case.

2. The door lock according to claims 1 wherein said plurality of locking bolts comprises a latch bolt, operatively linked to said locking mechanism, arranged for protruding sideways out of said lock case, wherein said latch bolt can be detached from said locking mechanism, rotated generally 180° about a principal axis of said latch bolt and re-attached to said locking mechanism, said lock case being formed with an access opening through which access can be gained to detach said latch bolt from said locking mechanism.

3. The door lock according to claim 1 or claim 2 wherein at least one of said plurality of locking bolts is linked by a link element to said locking mechanism, and said link element can be detached from said locking bolt, rotated generally 180° about a principal axis of said locking bolt and re-attached to said locking bolt.

4. The door lock according to any of the preceding claims and further comprising a housing mountable to an external surface of a door, said lock case being disposed in said housing, and a decorative cover attached to said housing.

5. The door lock according to claim 4 wherein said decorative cover comprises a middle portion with holes formed therein to accommodate protrusion therethrough of at least some of said locking bolts, said holes being symmetrical with

respect to said lock cylinder and said locking mechanism, a lower portion, and an upper portion, said upper portion being trimmable.

6. The door lock according to any of the preceding claims wherein said locking mechanism has a height which may be adjusted with respect to a height of a door.

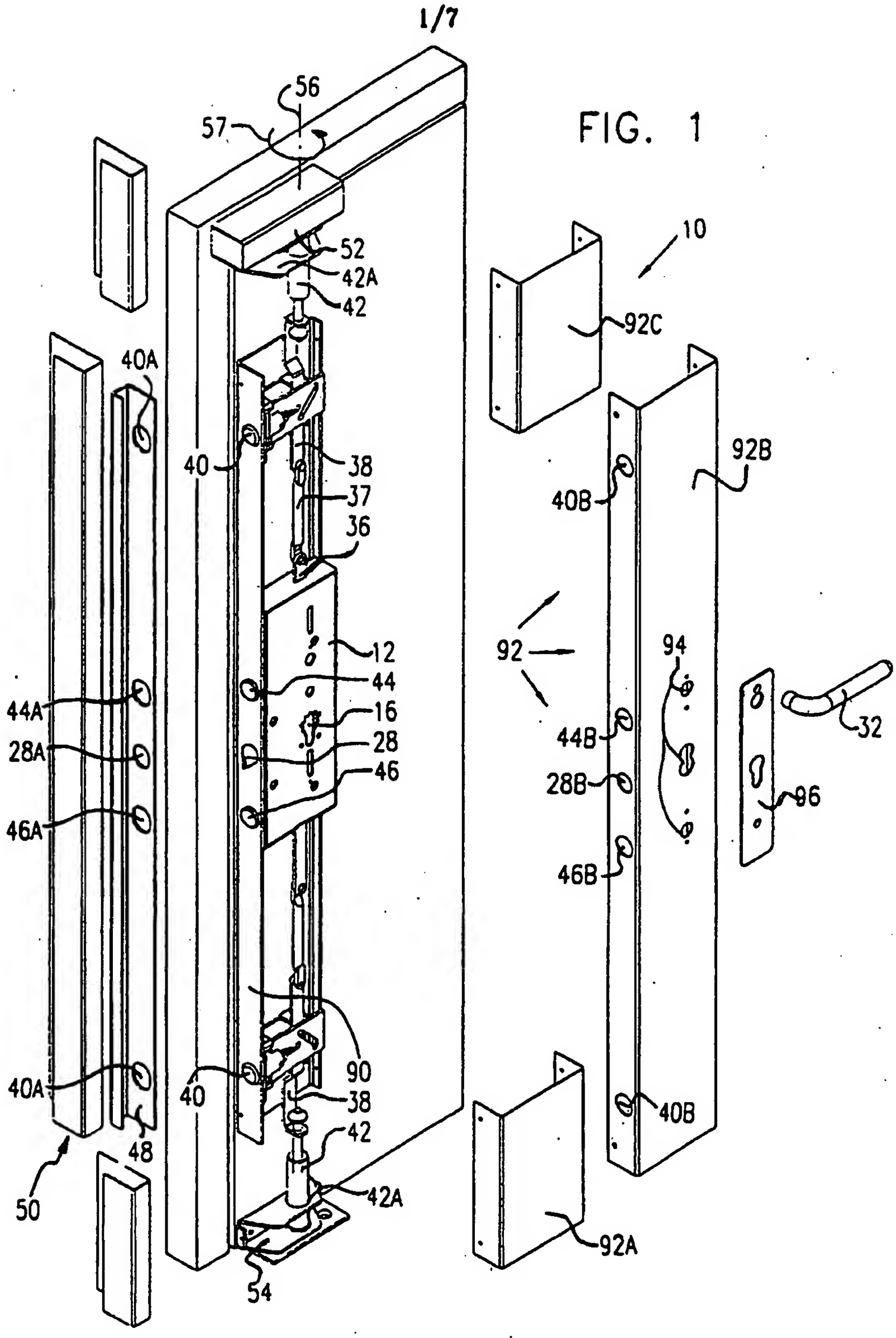
7. The door lock according to any of the preceding claims and further comprising a locking plate operatively linked to said locking mechanism and operative to block movement of at least one of said locking bolts when said locking mechanism is in a locked configuration, thereby causing said at least one locking bolt to be a dead bolt.

8. The door lock according to claim 2 and further comprising a locking plate operatively linked to said locking mechanism and operative to block movement of said latch bolt when said locking mechanism is in a locked configuration, thereby causing said latch bolt to be a dead bolt.

9. The door lock according to any of the preceding claims and further comprising a cylinder guard rotatably mounted on said lock cylinder.

10. The door lock according to any of the preceding claims wherein said lock cylinder is formed with at least one notch, and said lock case comprises at least one correspondingly formed protrusion which mates with said at least one notch.

FIG. 1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40B
92A

FIG. 2

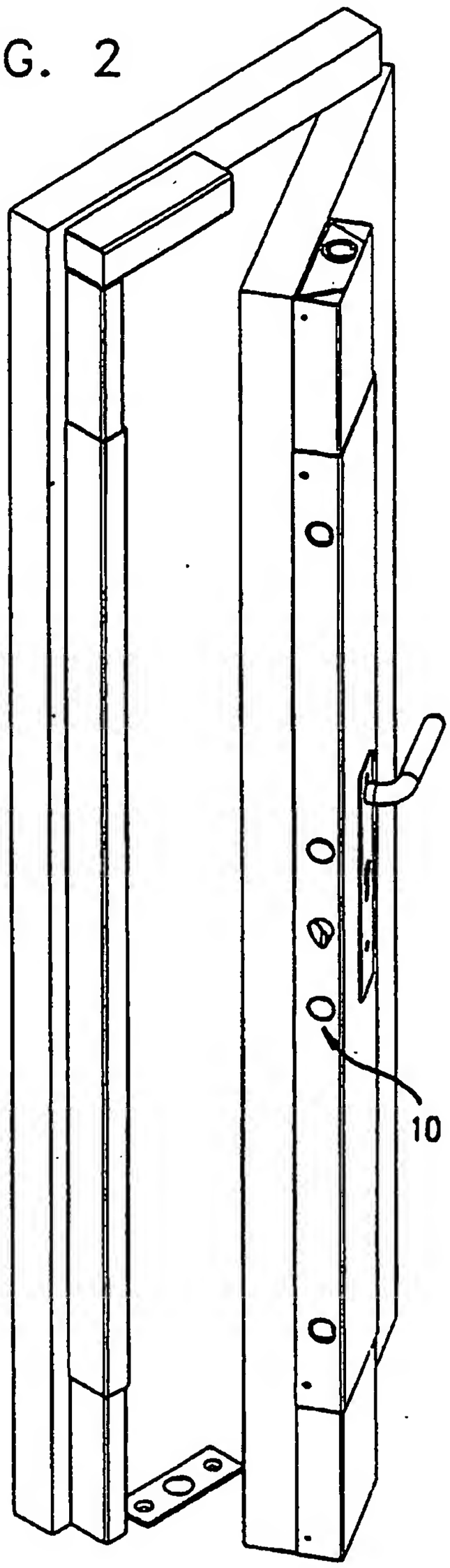


FIG. 3

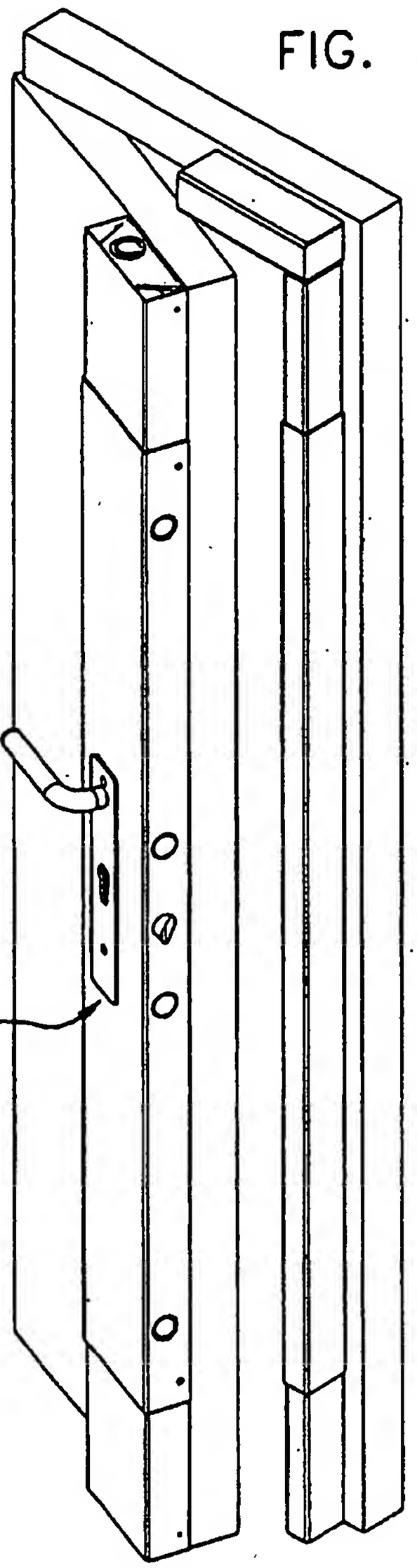
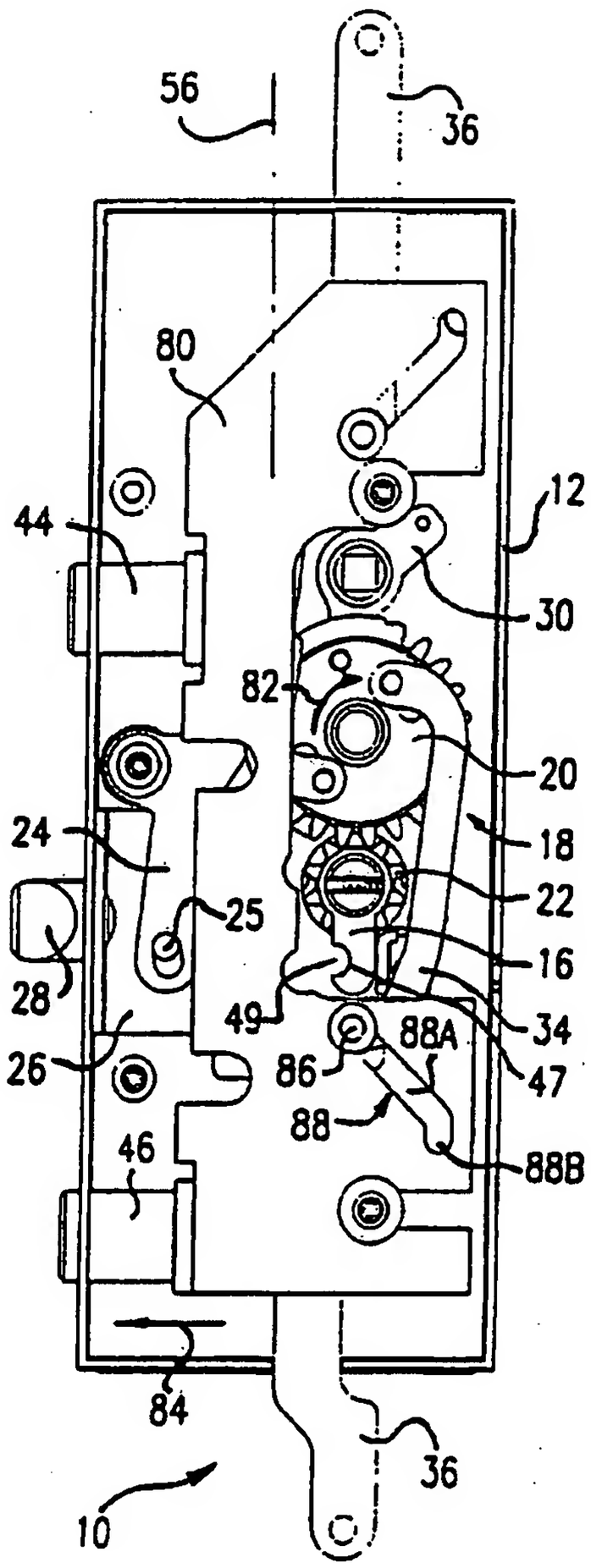


FIG. 4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88B
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FIG. 5

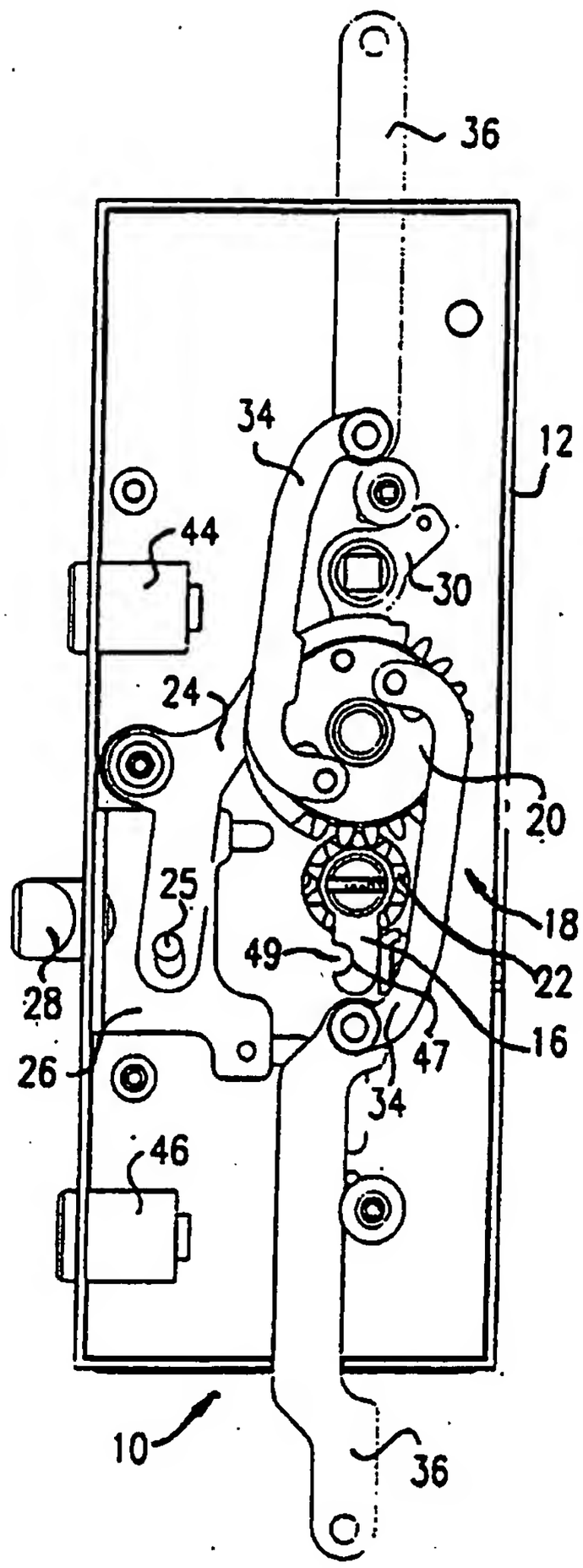
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FIG. 6

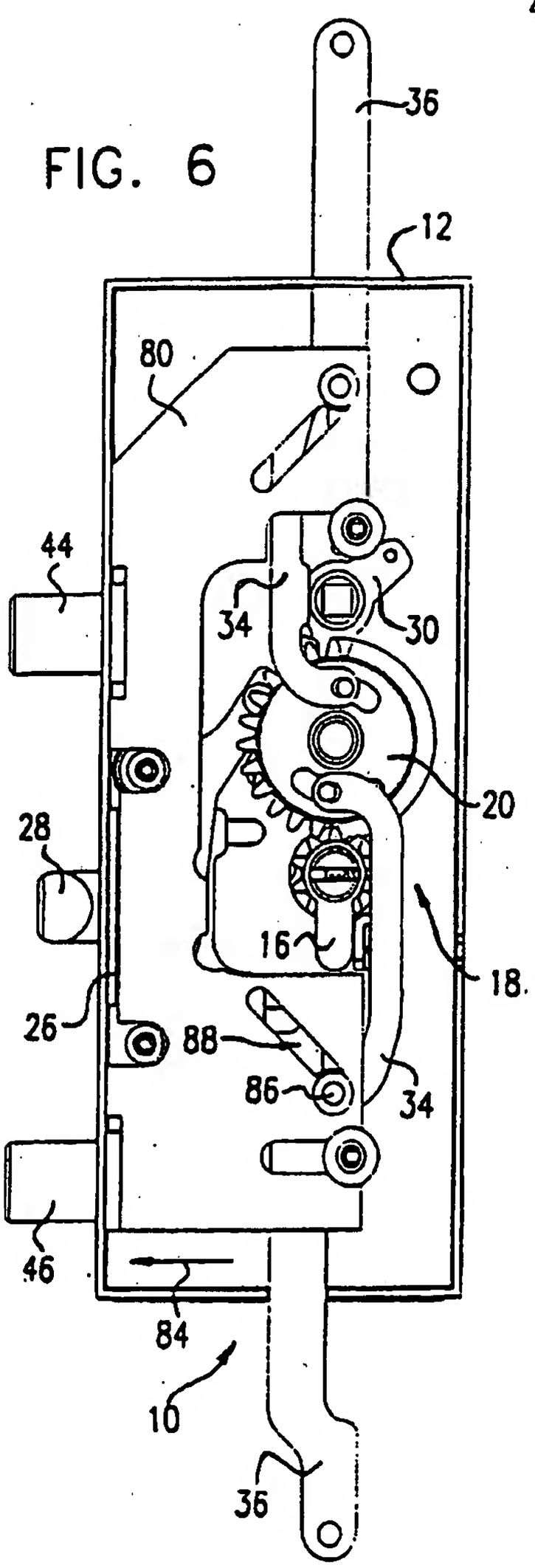
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FIG. 7

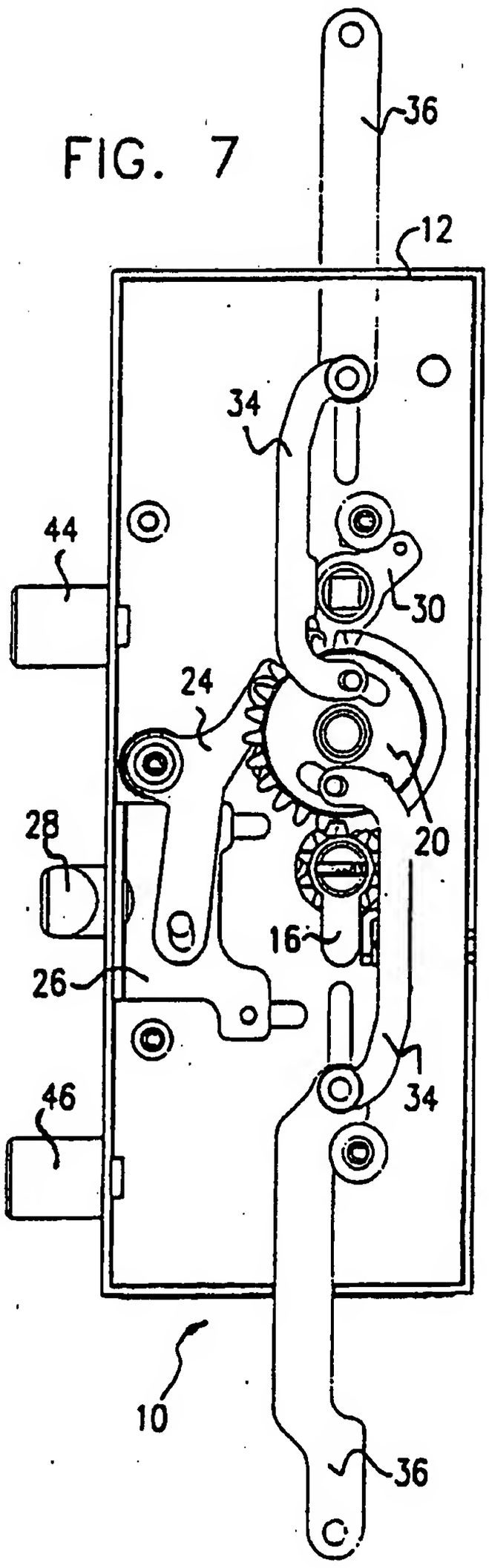
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FIG. 8

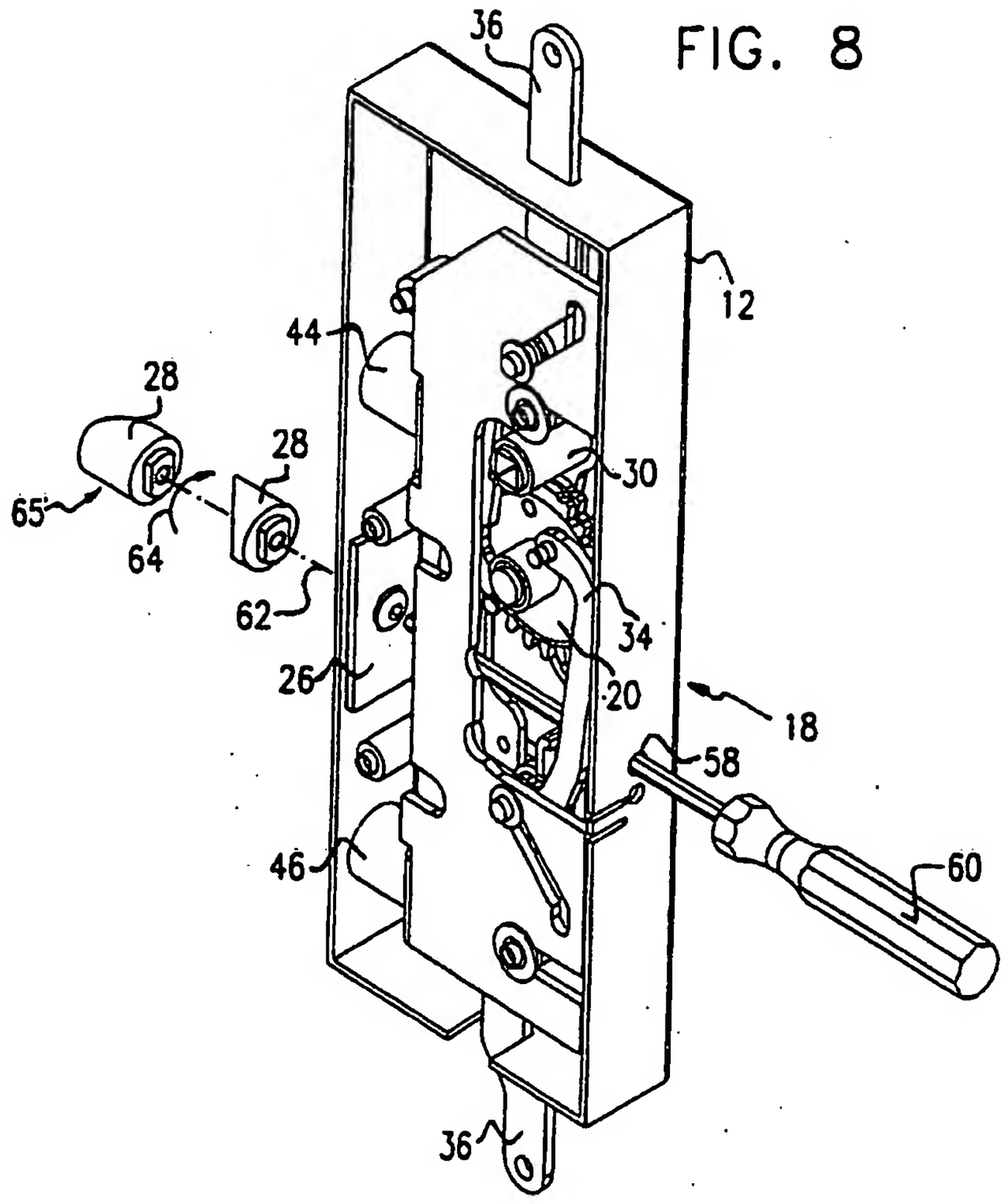

FIG. 9

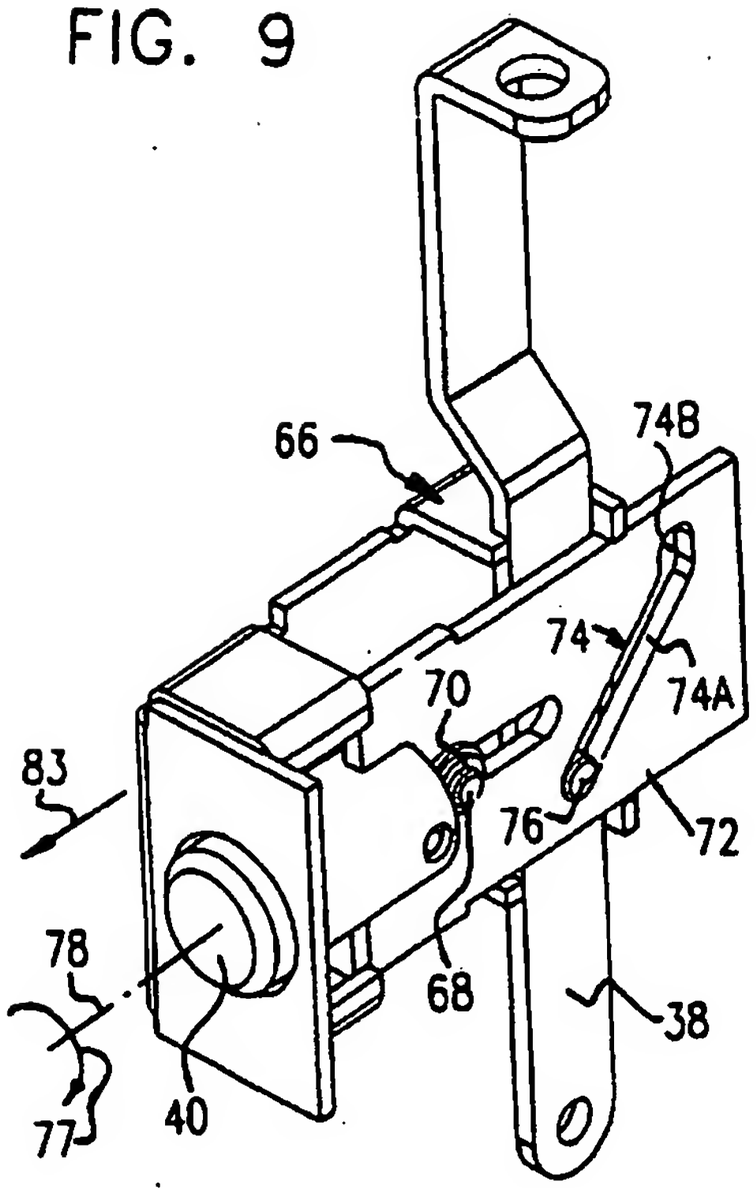
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FIG. 10

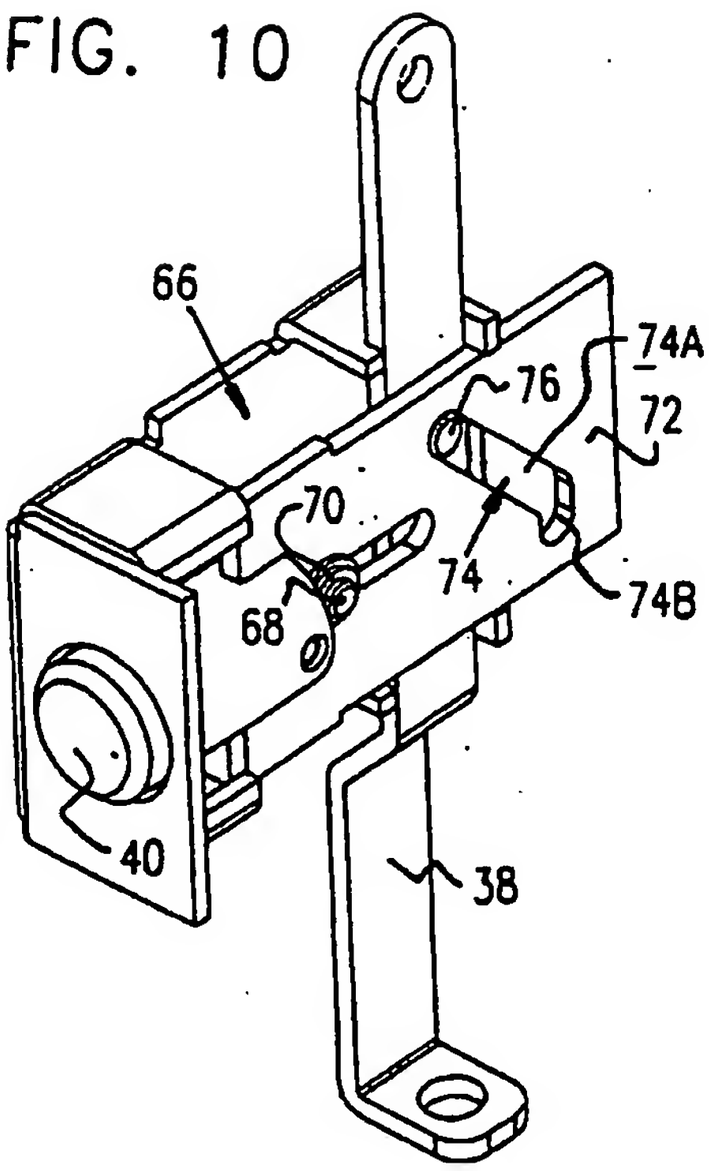
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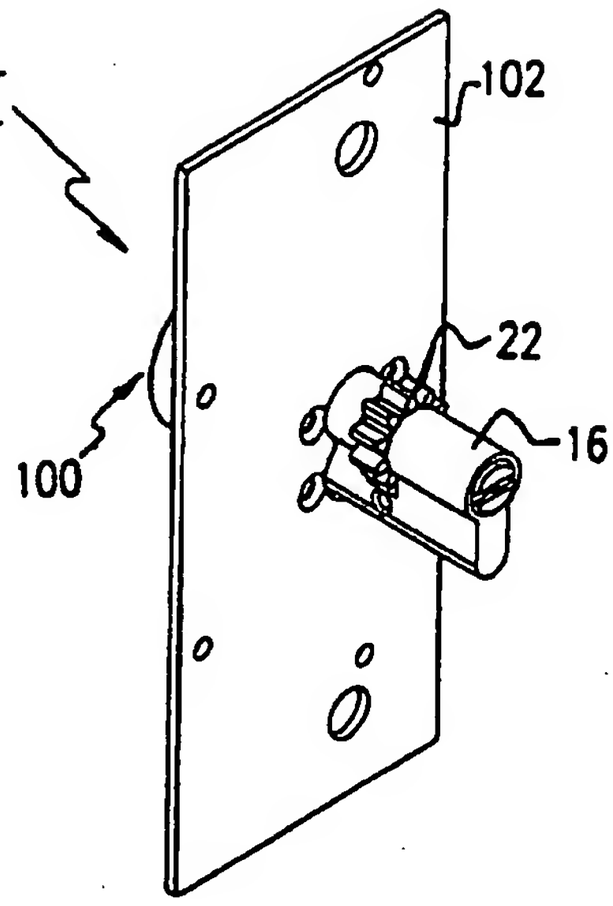
FIG. 11



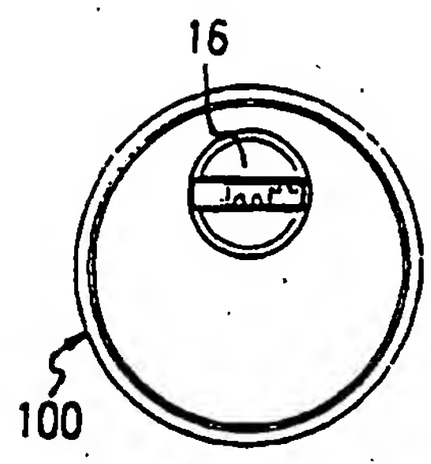


FIG. 12

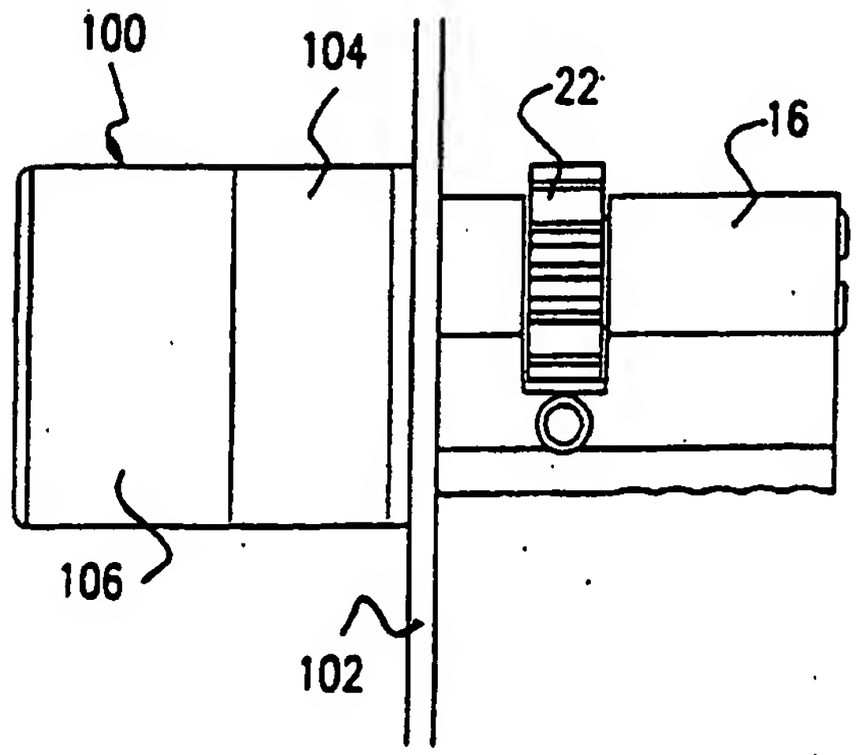


FIG. 13

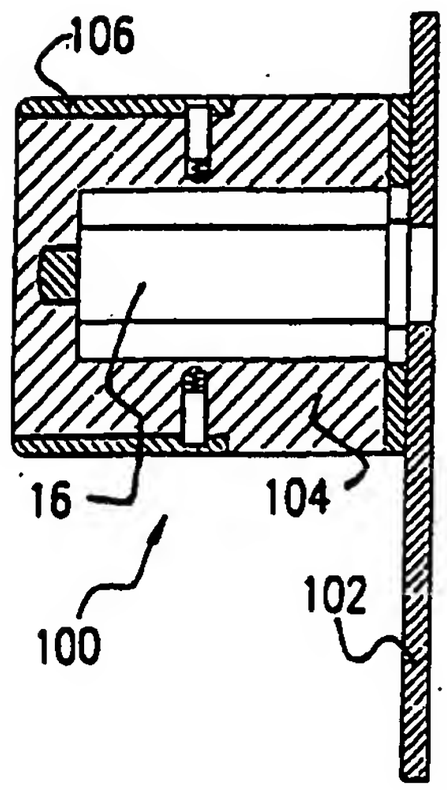


FIG. 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL00/00659

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :E05B 63/00
US CL :70/462; 292/244

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 70/462; 292/244

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 5,201,200 A (HAUBER) 13 April 1993 (13/04/93), see fig. 5.	1 --- 2,3
X --- Y	US 5,813,255 A (TELL,III ET AL) 29 September 1998 (29/09/98), see fig. 1.	1,2 --- 3
Y	US 4,695,082 A (MARKS) 22 September 1987 (22/09/87), see fig. 6.	3

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
12 MARCH 2001	03 APR 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer LLOYD A. GALL Telephone No. (703) 308-0828

Form PCT/ISA/210 (second sheet) (July 1998)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL00/00659

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 2054636 A (DORRENHAUS) 10 May 1972 (10/05/72), see fig. 1.	1-3
A	FR 2478173 A (BORGHESI) 18 September 1981 (18/09/81), see fig. 2.	2

Form PCT/ISA/210 (continuation of second sheet) (July 1998)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL00/00659

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 4-10
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest
☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.